DL720/31 DATA LOGGING SYSTEM

OPERATING INSTRUCTIONS
FOR
EM31 GROUND CONDUCTIVITY METER
WITH POLYCORDER SERIES 720

Version 4.00

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Contents

1. Introduction

The Geonics Data Logging System consists of a Polycorder Digital Data Recorder, Polycode programs and associated cables to connect the Polycorder to the Geonics EM31-DL Ground Conductivity Meter. This version of software allows to have data acquisition programs for any of Geonics conductivity meters in the single Polycorder 720.

This documentation describes the use of the Polycorder Series 720 with the DL720/31 System. Uploading the Polycorder program and downloading data files from the Polycorder are described in DAT31W manual.

The DL720/31 system runs programs on the Polycorder called EM31, DUMP, DUMP31W, CREATEDIR, BATTERY, and DEMO.

The program EM31 version 1.20 or later, allows to record data together with a time stamp at each station. Data file created with this program, while using this option, can be used to position survey according to locations recorded by a Global Positioning System (GPS).

Program EM31 acquires and records survey data from the EM31, under the control of the operator. It also records various field information such as survey line number (name), starting station, increment, recorded component, comments, etc. Readings are displayed in real time in mS/m and/or ppt. In AUTO mode readings can be recorded in 0.5 second time intervals for single component, and 0.6 second when both components are recorded. The program allows the user to check condition of the main battery, as well as an amount of free memory while taking data, without leaving the program. Approximately 10,000 readings can be collected in the Polycorder while reading both components (Quad-phase and Inphase), and approximately 16,500 readings when single component is recorded.

There is an internal directory file FILEDIR. Data files cannot be appended. See Section 5 for more details. Since the file FILEDIR has to be present in order to run EM31 program the CREATEDIR file is provided to create a directory file FILEDIR in case the latter was deleted by mistake or data files were erased manually.

The program BATTERY allows to examine voltage of main battery in the Polycorder. It is possible to get misleading reading when you first turn the Polycorder on. Therefore check the battery after the Polycorder has been running for several minutes.

Interpret the voltage of the Polycorder battery as follows:

    15.0 V maximum voltage
    10.8 V normal full charge
    10.3 V warning to recharge
     9.0 V shut off Polycorder.

To charge the batteries, plug a 120 VAC battery charger into the Serial I/O connector on the Polycorder. Fully discharged batteries require 14 hours to recharge.

The program DEMO allows to examine output of any analog channel in the Polycorder in mV.

2. The Polycorder

2.1   Turning the Polycorder ON and OFF

To turn the Polycorder on and off:

- press the Polycorder key marked **ON/OFF**

2.2   Polycorder Keypad

The following is a brief description of how to use the Polycorder keypad. It should suffice to enable the operator to use the EM31-MK2 system. More detailed information is available in the Polycorder manual.

KEY	DESCRIPTION
ESC	This key will exit whatever operation the Polycorder is in the process of doing and return to the MODE: prompt (see BUILT-IN POLYCORDER SOFTWARE).
ON/OFF	Turns Polycorder on or off.
SHF	Shift key. Used to access alphabetic and punctuation characters. Example: SHF 7 yields A SHF SHF 7 yields B SHF SHF SHF 7 yields C SHF SHF SHF SHF 7 yields 7 SHF SHF SHF SHF SHF 7 yields A again, and so on..
CLR	This key erases what was just typed and repositions the cursor so that the user may begin again.
CTL	Control key. Used to access characters which are not shown on the keyboard. The decimal 3-digit code of the ASCII character desired is entered after the control key is struck. Example: CTL 036 yields '$' CTL 062 yields '>'
ENTER	This key signals that the user has finished typing the required input.

KEY	DESCRIPTION
←	The back arrow function as a destructive back space when you enter keystrokes from the keypad. Some of the Polycorder built-in software uses this as a left direction key.
→	Some of the Polycorder built-in software uses this as a right direction key.
↓	Some of the Polycorder built-in software uses this as a down direction key.
↑	The Geonics EM31-MK2 program uses this key to return to the previous prompt. Some of the Polycorder built-in software uses this as an up direction key.

2.3   Built-in Polycorder Software

The Polycorder has a large amount of software permanently installed to control the basic operations of the machine. This software is available whenever the ESC key is struck and the Polycorder displays the MODE: prompt. The following is a short description of the options which may be selected at this prompt by pressing a numeric key (0-7).

OPTION	NAME	DISPLAYS	ALLOWS YOU TO:
| 0 | EXECUTE | ```
EXECUTE FORMAT
FILE:_
``` | Select the name of a program and then execute it when <ENTER> is pressed. Program can be selected using left and right arrow keys. |
| 1 | EDIT | ```
EDIT 1,2,3
DAT,FMT,PGM_
``` | Edit an existing file or create a new file of the selected type. |

Submodes:
1-1   Write or change data in a data file
1-2   Create or change a format file
1-3   Create or change a program file

OPTION	NAME	DISPLAYS	ALLOWS YOU TO:

2   **TRANSMIT SERIAL**

```
XMIT SER 1,2,3
DATA,FILE,MEM_
```

Transmit information from the Polycorder to another device via the RS-232 port.

Submodes:
2-1   Transmit contents of data file
2-2   Transmit a data, format, or program file
2-3   Transmit a memory image of the Polycorder

3   **LOAD SERIAL**

```
LOAD SER 1,2,3
DATA,FILE,MEM_
```

Load information from SERIAL another device via the RS-232 port.

Submodes:
3-1   Load data from another device into a Polycorder data file
3-2   Load a data, format, or program file from another device
3-3   Load a memory image from another device

4   **FILES**

```
FILE 1,2,3
DIR,ERA-F,ERA-D_
```

Review file directory erase file, erase the the data within a file.

Submodes:
4-1   File directory. Shows file names, sizes and related format files (if any)
4-2   Erase a file (remember to use Shift key with Y to confirm file name to be erased
4-3   Erase data in file without erasing the file

5   **SET PARAMETERS**

```
SET 1,2
AUTOLOG,PROTOCOL
```

Set automatic logging parameters or RS-232 communication protocol parameters.

Submodes:
5-1   Set the Polycorder for unattended data logging
5-2   Set the parameters for RS-232 communication

OPTION	NAME	DISPLAYS	ALLOWS YOU TO:

6   **TEST**

```
TEST 1,2,3,4
PGM,ANA,DIG,MEM_
```

Test program, or memory.

Submodes:
6-1   Run program step-by-step and view register contents after each instruction
6-2   Not used
6-3   Test the digital inputs and outputs
6-4   Check to see if all the storage locations are functioning properly

7   **MISCELLANEOUS**

```
MISC 1,2,3
CLK,BAT,TERM_
```

Set system clock/calendar, emulate a terminal.

Submodes:
7-1   Display and/or set the internal clock
7-2   Not used
7-3   Use the Polycorder as a terminal

3. Geonics Polycode Program

Normally Polycorder supplied with the EM31-MK2 system will contain necessary programs for running the instrument. In case that the programs in Polycorder are lost, please refer to section 3.1 of the DAT31W manual.

3.1 Starting the Program

1.   Get to the MODE: prompt
-      if the Polycorder is turned off, press the **ON** key
-      if the Polycorder is at any other prompt, press the **ESC** key
-      MODE: will be displayed on the 1st line display

2.   Execute the program called EM31
-      press **0**
-      at the FILE: either prompt EM31 will appear or use the left and right cursor keys to select file EM31
-      if the EM31 program is not in the Polycorder, hit **ESC** and download Polycorder from the computer as described above.

3.   When program starts it will display:

```
EM31 DATA LOGGER
```

3.2 Confirmation of the Polycorder Clock Setting

The date (month, day) and time (hour, minute) is taken from the Polycorder clock and written to the header file each time a new survey line is started. The Polycorder clock is usually set once, at the very beginning of the survey, in response to the **Set Clock? Y/N** prompt.
-      if clock is O.K., answer **N** to this prompt (see YES/NO answers) and next prompt will follow.
-      if clock setting is to be checked, answer Y (see YES/NO ANSWERS). The following prompt will be displayed:

```
        ESC, MODE 7-1,
             then run EM31
```

press ESC key, enter MODE 7-1 and adjust the Polycorder clock parameters. Then start the program.

The year number will be taken from the PC computer clock and written to the header file during the transfer of data from the Polycorder.

3.3   Specifying the Data File Name

1.   At the FILE: prompt, enter a file name
     -        file names are up to 7 alpha-numeric character.
     -        remember that the Polycorder creates two files, one (header file) with the prefix H
              and the entered name, and a second (data file) with the prefix D and the entered
              name. From now on names with prefixes will be used.
     -        use file names that are significant and easy to remember, such as the site name or
              number.
     -        do not use the name **ALL**
     -        do not use "/", "@", "." or other characters that are not accepted as part of a file name
              by MS DOS. A typical example of such character is +.
     -        because the program is executing many internal operations it will take approximately
              3 seconds for the next prompt to appear.

2.   File name conflicts
     -        if the file name (e.g. XXX) already exists the program will beep and display

```
        XXX      exists
        FILE:
```

     -        enter another file name

When using DAT31-MK2 computer program any number of data files can be entered. Once the file name is specified and entered to the program the file is opened and its name is written to log file FILEDIR. The FILEDIR can be considered as an internal directory. For more details about FILEDIR and program CREATEDIR see the PROGRAM CREATEDIR section.

3.   Erased data files

When files were erased using mode 4-2 they do not exist in Polycorder memory, however they may still be listed in file FILEDIR causing message: FILE exists (see above). In such a case enter other file name.

Contents of directory file FILEDIR is erased only when this file is erased using mode 4-2 (however the file has to be recreated in order to run EM31-MK2 program or DUMP existing data files) or if the logger is reset using supplied RESET module. See CLEAN OUT POLYCORDER AS DESIRED in section 3.

3.4 Answering Prompts

In the following prompts, a display of zero for numeric fields, and a `*' for alpha fields indicates a null entry (i.e. no change from previous entry). Just hitting the ENTER key will cause the current contents to be unchanged, unless `mandatory' is specified. `Mandatory' entries always require valid input, even when the current contents show a valid value. `Required' entries simply require the current contents of the field to be a valid input. `Unchecked' means that it is up to the operator to ensure that the required format is adhered to. When a string of prompts is presented, the operator may use the up arrow key to return to a previously entered field. Description of each prompt follow. The first description shows the general format of the other descriptions.

PROMPT	DESCRIPTION
displayed	- permissible format
	- optional, mandatory or required
	- additional notes as necessary
	Description of the field

PROMPT	DESCRIPTION

GPS Option Y/N
(Time Stamp at each reading)

- 1 character, alphabetic only (**Y**, **N**) entry as keys **3** or **5**, <u>no</u> SHIFT!. Although entry keys are numerical, they are converted to alphabetic by the program.
- checked
- short display pause after key struck, no ENTER required.

Selects GPS option.

| **Y** | - | time stamp will be recorded with each reading, |
| **N** | - | GPS option will be disabled. |

Phase Q/I/B

- 1 character, alphabetic only (**Q**, **I**, **B**) entry as keys **6**, **9** or **7**, <u>no</u> SHIFT !
- mandatory entry each time this prompt displayed, checked
- short display pause after key struck, no ENTER required

Selects either Quad-phase (Conductivity), Inphase or Both at each station.

Although entry keys are numerical, they are converted to alphabetic by the program.

Mode V/H/B

- 1 character, alphabetic only (**V**, **H**, **B**) entry as keys **2**, **9** or **7**, <u>no</u> SHIFT !
- mandatory entry each time this prompt displayed, checked - short pause after key struck, no ENTER required

Selects either Vertical, Horizontal or Both modes of measurements at each station. Although entry keys are numerical and they are converted to alphabetic by the program.

PROMPT	DESCRIPTION

ORIENTATIONS 1/2 -   1 digit, numeric only (1 or 2)
-     mandatory entry every time this prompt displayed, checked
-     short pause after key struck, no ENTER required

Selects either 1 or 2 instrument orientations at each station. This option can be used to obtain horizontal and/or vertical dipole readings in both 0 and 90 degree common axis rotation at one station. It can be used also to record readings at two heights of the instrument above the earth.

The ORIENTATION is not recorded in the logger.

Therefore, if option **2** is used, it is up to the operator to keep the recording procedure uniform. For example, 90 degree rotation might follow a 0 degree measurement at every station. This procedure should be kept in mind during data processing using the DAT31W program on the PC computer.

OPERATOR -   up to 7 alpha-numeric characters
-     optional, unchecked

Operator's name or identification symbol

COMMENT -   up to 16 alpha-numeric characters
-     optional, unchecked

Any comment (such as location name, field notes, etc.) which helps document data.

AUTO (Y/N) -   1 character, alphabetic only (**Y**, **N**) entry as keys **3** or **5**, <u>no SHIFT</u>!. See YES/NO Answers section.
-     mandatory entry every time this prompt is displayed
-     short display pause after key struck, no ENTER required
-     this prompt won't be displayed if BOTH mode or 2 ORIENTATIONS has been selected (see Mode V/H/B and Orientations 1/2)
-     automatic data readings will not be started until the WAIT key is pressed (see MEASURING THE DATA - AUTO MODE below)

Selects whether or not data will be acquired automatically at the interval specified with the following prompt.

PROMPT	DESCRIPTION

INTERVAL (SECS)   -   4 digit, positive numeric only (0.4 to 99.9)
-   units of seconds
-   displayed when response to AUTO prompt is A
-   required, checked for an entry other than zero

This prompt request the interval (in seconds) between data readings, if AUTO mode is selected.

LINE: -   up to 8 alpha-numeric characters
-   optional, unchecked

User's tag number/name for the profile name.

When next line is entered within the same file the name of the previous line is displayed on the top line of the Polycorder display.

LINE DIRECTION   -   1 character, alphabetic only (**N**, **S**, **E**, **W**) entered as keys **5**, **1**, **8** or **2**, no SHIFT !
-   mandatory entry every time this prompt is displayed
-   checked
-   short pause after key is struck, no ENTER required

A direction character (**N**, **S**, **E**, **W**) indicating the heading of the survey line. Although entry keys are numerical, they are converted to alphabetic values by the program.

START STATION   -   7 digit, signed numeric only (-9999.9 to 9999.99)
-   required, not checked

Specifies the starting number for the station number display. (See MEASURING THE DATA - AUTO MODE for suggestions on how to use this field in AUTO mode). Used in conjunction with INCREMENT to calculate the current station number for display purposes. By convention positive station numbers signify stations which are on the LINE DIRECTION side of the reference line. Negative station numbers signify stations which are on the opposite of LINE DIRECTION side of the reference line.

Example:
If LINE DIR. was entered as W then
a station # of +10 is considered as 10W
a station # of -10 is considered as 10E
If LINE DIR. was entered as S then
a station # of +10 is considered as 10S
a station # of -10 is considered as 10N

PROMPT	DESCRIPTION

INCREMENT
(manual mode)

- 5 digit, signed numeric (-9999 to 9999)
- assumed to be in user units
- required, checked for non-zero

Specifies the amount by which the station number will be incremented/ decremented by between each station. (See MEASURING THE DATA - AUTO MODE for suggestions on how to use this field in AUTO mode). When the BOTH mode of operation and/or BOTH orientations is selected (see MODE V/H/B and ORIENTATIONS 1/2) the station number will be incremented after all of the readings at the station will be taken. In this case a colon with the proper number of readings will follow the station number.

INCREMENT (+/-)
(Auto Mode)

- 1 character only, + or - entered as keys 0 or . , no SHIFT !
- mandatory entry every time this prompt displayed, checked
- short pause after key struck, no ENTER required

A station increment the direction character (+, -) indicating the heading of the survey line.

Selects either increment +1 or -1. Although entry keys are numerical, they are converted to +1 or -1 by the program and written to file as an INCREMENT.

3.5   YES/NO Answers

All prompts within the EM31-MK2 Polycode program which expect YES or NO answers require either the key **3** (unshifted **Y**) or the **5** key (unshifted **N**) to be pressed. All other answers will result in an error beep tone and rejection of the input. This has been done to reduce the key strokes required by eliminating the shift key.

3.6   Measuring the Data

When all the prompts have been answered and the EM31 Polycode program is ready to record data, it will display

```
READY
   ENTER to LOG
```

After ENTER is pressed the Polycorder will display ST and the current station number on the bottom line of the display. This is the station number of the station at which data is expected to be recorded. Data can be recorded automatically at the selected intervals (AUTO mode), after WAIT

key (ENTER) is pressed or manually when the "record" switch is activated. When AUTO mode is selected, the message **ENTER to START** will appear on the top line (and **not logging** on the following line) of the display. If manual mode is selected, the message **logging** will appear on the top line, and the Polycorder will display **ST** as well as the current station number on the second line of the display. This is the station number of the station at which data is expected to be recorded.

The Polycorder will record the conductivity (Q/P) and/or Inphase (I/P) readings, vertical or horizontal dipole (mode) and the sensitivity range. The Polycorder will then calculate the next station number (and reading number in case of the Both Mode or 2 Orientations) and update the **ST** display. The readings will be calculated according to the sensitivity range and displayed in mS/m and/or ppt. The dipole mode is displayed as well.

Measuring the Data - Manual Mode

1. Connect EM31 to the Polycorder with the supplied cable and turn the instrument ON.
    -   select an appropriate EM31 scale on the instrument
    -   use the EM31 range switch to select the appropriate sensitivity
    -   Polycorder will record the range used when the data is recorded

2. Select dipole orientation
    -   set instrument to the appropriate position
    -   Polycorder will record which coil orientation was used for each reading when the data is recorded

3. Select component
    -   set component switch for OPER if Both or Conductivity (Quad-phase) component is to be measured
    -   set switch for COMP if only Inphase is to be measured

4. Record data
    -   press the recording switch on the side of the boom
    -   short beep will signal the data is being recorded. When survey is conducted in noisy area (construction site, traffic noise, etc.) observe update of station (ST) on the Polycorder screen to ensure that the reading was recorded.
    -   program will record only once for each press of the switch. If the switch is pressed again before the program has finished updating the display, the switch press will be ignored

5. Record extra data
    -   used only with BOTH mode or 2 orientations. Re-orient instrument. Record data. Record number will be updated.

6. Advance to next station

Measuring the Data - Auto Mode

IN AUTO mode only one dipole mode (**V** or **H**) and orientation **1** can be measured during survey. START STATION is used to indicate start point of the survey line. The increment, entered as + or -, indicates direction along the survey line. It is considered to be +1 or -1. This will result in the ST number display showing the number of data readings that have been taken.

1. Select an appropriate EM31 scale on the Geonics instrument
   - as above. See manual mode

2. Select dipole (coil) orientation
   - if using the Horizontal or Vertical dipole mode of operation, rotate the instrument to the appropriate position and leave it in this position
   - Polycorder will record which dipole orientation was used for each reading when the data are recorded

3. Start AUTO readings
   - when AUTO mode was selected the program sets the Polycorder in a 'pause' mode. **ENTER to START** is displayed on the top line of the Polycorder display. Readings are temporarily suspended.
   - use **WAIT** key (see FIELD OPTIONS - WAIT below) to start automatic readings at preset time intervals. A reading will start as soon as the **WAIT** key is struck, and at the selected intervals thereafter. The message **ENTER to STOP** will be displayed at the top line of the display.

4. Advance along the survey line

5. Stop the AUTO readings when the end of the survey line is reached
   - use the **WAIT** key to pause/stop the automatic collection of data.

3.7 Fiducial Marker Option

In AUTO mode, the trigger switch that is used in manual mode can be used as a fiducial switch. This action places a flag at a desired points along the survey line, such as the location of a visible feature. The PC computer program DAT31-MK2 recognizes these flags as markers. This procedure helps to adjust the station intervals along the survey line more accurately. The character **M** is displayed while the fiducial marker is pressed.

> **The fiducial switch must pressed while reading is taken. It is always safer to press switch longer. If two or more marker flags are recorded consecutively the DAT31-MK2 program recognizes only first as a marked station. However it plots all of them, so some points will appear as double or triple marks.**

3.8 Field Options

In addition to recording data at the STATION display, the user may also select other actions as described below. The options are selected by pressing the appropriate key on the keypad. Most keys do not require any shift action. Each key is shown in bold and its associated mnemonic is shown in square brackets. These field options are available in both manual and automatic modes of operation.

If the AUTO mode is in use and if the field option is the type which returns to the STATION display (COMMENT, DELETE, REVIEW, LINE, STATION, TEST BATTERY, and VERIFY MEMORY), the internal clock will be checked to see if the TIME INTERVAL had been exceeded

while undertaking the field option. If so, a data reading will be taken immediately and further readings will be taken at the designated TIME INTERVAL from that point on.

If the field option exceeds more than one TIME INTERVAL, extra readings will NOT be taken to 'catch up'.

OPTION	DESCRIPTION

7 [C]   **COMMENT**

Selecting this key causes **Enter Comment** prompt to be displayed. A comment may be entered as described in the PROMPT section of this document. After the comment is entered the program will return to the display. The user must exit the comment mode by pressing ENTER before new data may be collected or additional field options selected.

Maximum 16 characters can be entered as a comment information.

This function is typically used to comment on survey conditions such as presence of power line, fence, pipeline, etc.

The message "GPS Option On" or "GPS Option Off" will be displayed at the bottom of the screen to confirm selected entry at the beginning of the program.

8[D]   **DELETE**

This function allows operator to delete previously recorded reading(s). Selecting this key causes the previously recorded data to be displayed. A 'D' will be displayed at the left side of the display signifying the program is in the delete mode. The data will only be deleted when the **8** [D] key is pressed again. The data will be briefly re-displayed with an 'X' at the left side to show that this data has been deleted. The program will then display the next previous station, and allow it to be deleted in a similar fashion. Pressing any other key will exit delete mode without affecting the displayed data. If no further data are available the program will beep and wait for any other key to exit the delete mode.

It is only possible to delete data and skipped stations (see NEXT). Comments are not displayed, may not be deleted and will remain in the file. The delete mode will not back up past a change in header information (a STATION and a LINE action). If an attempt is made to enter the delete mode when there is no data to delete, the program will beep and return to the STATION display. The user must exit the delete mode (press any key other than (**8**[D]) before new data may be collected or additional field options selected.

4 [L]   **LINE**

Selecting this key allows the operator to enter a new survey line number (or name) and associated information (DIRECTION, INCREMENT and START STATION)

OPTION	DESCRIPTION

as described in the PROMPT section of this document. When all prompts have been answered the program will display the new station number.

The user must exit the prompt mode (enter all prompts) before new data maybe collected or additional field options selected.

If a second or subsequent line is entered within the file, the previously entered line number (or name) will be displayed on the top line of the display.

The message "GPS Option On" or "GPS Option Off" will be displayed at the bottom of the screen to confirm selected entry at the beginning of the program.

5 [N]   NEXT

Selecting this key allows the operator to skip a reading. A special flag is recorded in the data to distinguish skipped data from normal data. The station number or record number advances as appropriate.

6 [R]   REVIEW

This key causes the program to enter the review mode and allows the operator to review previously recorded data. The previous station data is displayed with a **R** at the end of the STATION line to indicate review mode.

Q/P data are displayed in mS/m (millisiemens/meter), and I/P data are displayed in ppt (parts per thousand). The recorded dipole mode, component, and fiducial marker (if present) are shown a well.

```
Recall              R
STN   123.0 :2 V
Q:    21.120 mS/m
I:    10.00  ppt
```

If both components are recorded, both will be displayed.

Pressing **6**[R] again will display the next previous station and so on. Only data and skipped data will be shown. Review mode will not back up past a change in header information (STATION or LINE action).

Pressing any other key will return the user to the STATION display. If an attempt is made to enter REVIEW mode when there is no data to display, the program will give an error beep and return to the STATION display. The user must exit the review mode (press any key other than **6**[R] before new data may be collected or additional field options selected.

1 [S]   STATION

This key allows the user to enter a new START STATION and a new INCREMENT as described in the PROMPT section of this document. After all prompts have been

OPTION	DESCRIPTION

answered the program will display the new station number. The user must exit the prompt mode (enter all prompts) before new data may be collected or additional field options selected.

2 [V]   **VERIFY** (HOW MANY READINGS LEFT)

This key causes the program to display (for about 2 seconds) the number of readings that can be taken to fill the memory of the Polycorder.

```
ROOM for   2033
         READINGS

GPS Option Off
```

The message "GPS Option On" or "GPS Option Off" will be displayed at the bottom of the screen to confirm selected entry at the beginning of the program.

9 [G]   **BATTERY**

This key causes the program to display (for about 2 seconds) the voltage of the main battery in the Polycorder. Refer to Section 5 for information about charging the Polycorder battery.

The message "GPS Option On" or "GPS Option Off" will be displayed at the bottom of the screen to confirm selected entry at the beginning of the program.

ENTER   **WAIT**

This key toggles the auto timer on and off. If the user has not selected AUTO mode triggering, the program will beep and ignore this key. When AUTO mode triggering has been selected, this key starts and stops (pauses) the trigger timer. The message on the top line of the Polycorder display will show **ENTER to START** or **ENTER to STOP** as appropriate.

E or **<ESC>**   **END**

This key closes the current data file and returns the user to the **FILE:** prompt, at which point a new data file for data entry may be selected. Note that the shift key must be used to select this option (**E**), to prevent accidental closure of the file. For this reason **<ESC>** key should be avoided as a routine ending of the file.

Z   **SLEEP**

This key closes the current data files and turns off the Polycorder into a power saving sleep mode. Note that the shift key must be used to select this option, to prevent accidental closure of the file.

3.9 Clean Out Polycorder as Desired

Specific data files may be deleted from the Polycorder using Polycorder mode 4-2. While using this mode remember that during confirmation of the name to be deleted key with character Y is to be used with <SHF> key.

OR

all files can be cleaned out by turning the Polycorder ON with the RESET module in 25 pin port. In this case if DOS based DAT31 is used the Mating Call has to be reset to <CR> in Polycorder mode 5-2, and FORMDL.720 and EM31 files have to be loaded to the Polycorder. For more information see beginning of this section.

4. Programs **CREATEDIR, DEMO, and BATTERY**

CREATEDIR

The file FILEDIR contains all entered data file names. This file is contained by the EM31 file and is present in the Polycorder after downloading the logger. The empty FILEDIR contains just one line, **ALL**. In order to run the EM31 program the FILEDIR has to be present in the Polycorder.

The program CREATEDIR can be used to create FILEDIR in case FILEDIR was deleted for any reason. After the program is run the Polycorder displays for 1 second:

```
FILEDIR created
OK.
```

If the program is run by mistake it doesn't destroy the existing FILEDIR.

In case the data files are erased one by one (using MODE 4-2) the erased names are still present in the FILEDIR and therefore can't be entered into the program. If all files are deleted using MODE 4-2 and same names are to be used, the FILEDIR can be erased using the same MODE 4-2. Then this file has to be created by running program CREATEDIR.

If the directory file FILEDIR is erased by mistake it can be created using the CREATEDIR program. However, the newly created file will not contain the data files created prior to running the CREATEDIR program. In this case it is up to operator to remember which names were already entered. This can be verified using the Polycorder MODE 4-1.

DEMO

This program can be used to monitor (in mV) all analog channels in the Polycorder.

BATTERY

This program will display the voltage of the Polycorder battery in Volts. Pressing any key will abort this program.

The program BATTERY allows to examine voltage of main battery in the Polycorder. It is possible to get misleading reading when you first turn the Polycorder on. Therefore check the battery after the Polycorder has been running several minutes.

Interpret the voltage of the Polycorder battery as follows:

15.0 V   maximum voltage

10.8 V   normal full charge

10.3 V   warning to recharge

 9.0 V   shut off Polycorder.

To charge the batteries, plug a 120 VAC battery charger into the Serial I/O Connector. Fully discharged batteries require 14 hours to recharge.

5. EM31 File Description

The EM31 POLYCODE program records a set of data in two separate files. The file name supplied by the user at the **FILE:** prompt (xxxx) is prefixed by an "H" to create a header file named "Hxxxx" and is prefixed by a "D" to create a data file named "Dxxxx". There will be an example of the header and data file at the end of this section. The format of each file is as follows.

5.1 Header File

The header file has 15 fields with the following descriptions:

FIELD	DESCRIPTION
MONTH	2 digit, decimal, numeric (1-12) This field is automatically filled in whenever a new line name is specified in the Polycorder. Zero signifies a null entry.
DAY	2 digit, decimal, numeric (1-31) similar to MONTH field.
HOUR	2 digit, decimal, numeric (0-23) similar to MONTH field. This marks the time when the new line name was specified.
MINUTE	2 digit, decimal, numeric (0-59) similar to HOUR field.
ORIENTATIONS	1 digit, decimal, numeric only (1 or 2). This field identifies the number of instrument orientations used at each of the stations following. It must be supplied by the user, and a check is made for valid entry data. Zero signifies no change in ORIENTATIONS number.
OPERATOR	6 character, alpha-numeric The operator's name or similar comment is supplied by the user. No check is made for entry validity.
MODE V/H/B	1 character, alphabetic (V, H or B) This field identifies the mode of operation Vertical, Horizontal or Both - at all the stations following. It must be supplied by the user, and a check is made for valid entry data.

FIELD	DESCRIPTION

COMPONENT Q/I/B   similar to MODE V/H/B

COMMENT   16 character, alpha-numeric
This field is supplied by the user and contains any comments (such as site location, field notes, etc.).

LINE   8 character, alpha-numeric
This field contains the user's line number (or name). No check is made on this field.

DIRECTION   1 character, alpha numeric
This field contains a direction indicator W, E, N or S. It must be supplied by the user, and a check is made for valid entry data.

AUTO (Y/N)   1 character, alpha-numeric
This field identifies whether manual triggering or automatic timed interval triggering of the data recorder was used. This field must always be supplied by the user. Only Y or N entries will be accepted from the keyboard. Null entries from the keyboard will not be accepted, even when the field has been previously filled. A '*' signifies no change in mode.

TIME INTERVAL   4 digit, decimal, numeric (.5 - 99.9)
If auto triggering is in use, then this field specifies the triggering interval in seconds. If in auto trigger mode this field is checked for valid contents. In this mode zero signifies a null entry and is not allowed as an input from the keyboard.

INCREMENT   5 digit, decimal, numeric (-99.9 to 999.9)
This field specifies by how much to increment the station number between each station. This field must be specified by the user and is assumed to be in whatever units the user desires. This field is used in conjunction with the START STATION field to calculate the current station for display purposes. A null (zero) entry is not acceptable.

START STATION   5 digit, decimal, numeric (-9999 to 99999)
This field specifies the starting value for the current line. This field must be specified by the user and is assumed to be in whatever units the user desires.

POINTER   4 digit, decimal, numeric (1 - 9999)
This field is automatically filled in by the Polycorder program. It acts as a pointer to the data file by specifying the line number of the file where the header information applies.

5.2 Data File

The data file has two or three fields with the following description:

FIELD	DESCRIPTION
Q/P (V)	8 digit, decimal, numeric (-9.99999 - +9.99999) This field normally contains the Quadrature data (-1.99999 to 1.99999 measured in Volts) when B or Q was selected as a component. If I was selected this field contains Inphase component (see below). It may also contain special flags (see DATA FLAGS).
I/P (V)	8 digit, decimal, numeric (-9.99999 - +9.99999) This field (second analog field) exists only if B at component prompt was selected. It contains the Inphase component (-1.99999 to 1.99999 measured in Volts). It may also contain special flags (see DATA FLAGS).
DIGITAL	4 digit, decimal, numeric (0000 - 9999) This field normally contains digital data represented in decimal form (0-255). It may also contain a pointer to the header file (see DATA FLAGS). When converted to its equivalent binary form, the bit representation is as follows:

Bit	Description	Decimal
0-2	3 Least significant bits encode the EM31 measuring scale used, described below.	
	001 1000 mS/m scale	1
	010 300 mS/m scale	2
	011 100 mS/m scale	3
	100 30 mS/m scale	4
	101 10 mS/m scale	5
	110 3 mS/m scale	6
3	Not used	
4	0 - no marker	0
	1 - marker (trigger in AUTO MODE)	16
5	Not used	
6	Not used	
7	Vertical/Horizontal mode	
	0 - Vertical mode	0
	1 - Horizontal mode	128

5.3   Data Flags

Normally, data file fields are used to record the EM31 data readings. In the event of editing or header changes, a numeric flag is placed in the first field of the data file (Q/P if Both components are recorded). This coded numeric flag is chosen to be outside the range of normal EM31 data and may signify a number of different events, as described below. Flags are the absolute value of the integer portion of the data.

FLAG	DESCRIPTION

4 **COMMENT**

This flag signifies a comment has been included at this point. The DIGITAL field of the data file contains the line number in the header file where the comment is stored. Only the comment field of that line in the header file is filled in and valid. The header file PTR field will point to the line in the data file which contains this FLAG.

5 **END-OF-FILE**

This flag signifies the end of the data file. There is no corresponding header file entry. The DIGITAL field of the data file contains zero. When the data file was previously ended and then re-opened this flag is replaced by HEADER flag.

6 **SKIP (NEXT)**

This file signifies that a reading at this station was skipped. The skip flag is placed in the first data file field and a zero is placed in the DIGITAL field. There is no corresponding header file entry.

7 **HEADER**

This flag signifies that some header information has been set or changed. The HEADER flag is placed in the analog field. The DIGITAL field contains the line number of the header file which corresponds to this HEADER flag. If the data file is being opened, or re-opened, then all fields of the header file may be significant. If a STATION command was used to create this HEADER flag then only the START STATION and INCREMENT header fields are significant. If a NEW LINE command was used to create this HEADER flag, then the LINE, LINE DIRECTION, INCREMENT, and START STATION fields of the header file may be significant. To determine which fields have changed, examine each field of the header file for non-null entries. (Null entries are zero for numeric fields, and * for alpha-numeric fields). The PTR field of the header file will contain a pointer to this HEADER flag.

8 **DELETE**

This flag signifies data which has been deleted. A constant of 8 was added to the value of previously recorded data at this point to show deletion. Therefore the sign of the data can be recognized in this case. This allows the value of the data to be recovered by subtracting the constant value 8. An exception is the case of deleting a skipped piece of data. In this case the DELETE flag 8 merely replaces the SKIP flag.